

## **REMARKS**

Entry of the foregoing amendments is respectfully requested.

### **Summary of Amendments**

Upon entry of the foregoing amendments, claim 20 is amended and claims 22, 23, 40 and 41 are cancelled, whereby claims 20, 21 and 24-39 will be pending, with claim 20 being the only independent claim.

Support for amended claim 20 can be found throughout the present specification (see, for example, pages 1-3) and in the cancelled claims.

Applicant emphasizes that the amendment to claim 20 and the cancellation of claims 22, 23, 40 and 41 are without prejudice or disclaimer, and Applicant expressly reserves the right to prosecute the cancelled claims and the amended claim in its original, unamended form in one or more continuation and/or divisional applications.

It further is submitted that entry of the instant Amendment is proper because it does not raise any new issues and does not require a further search. In fact, amended claim 20 corresponds generally to a combination of former claims 20, 22 and 23 and thus, has already been considered by the Examiner.

### **Summary of Office Action**

As an initial matter, Applicant notes with appreciation that the Examiner has indicated consideration of the Supplemental Information Disclosure Statement filed April 28, 2011.

Claims 20-22, 26-38 and 40 remain rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Singh et al., U.S. Patent No. 5,077,371 (hereafter “SINGH”), in view of Althaus et al., U.S. Patent No. 4,950,792 (hereafter “ALTHAUS”), in further view of Sondhe et al., U.S. Patent No. 5,340,652 (hereafter “SONDHE”).

Claims 23 and 41 are newly rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over SINGH in view of ALTHAUS in view of SONDHE in further view of McGaughey et al., U.S. Patent No. 3,646,651 (hereafter “McGAUGHEY”).

Claims 24 and 25 remain rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over SINGH in view of ALTHAUS in further view of SONDHE and in further view of Motsinger et al., U.S. Patent No. 3,217,536 (hereafter “MOTSINGER”).

Claim 39 remains rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over SINGH in view of ALTHAUS in further view of SONDHE and in further view of Chapin, U.S. Patent No. 4,089,215 (hereafter “CHAPIN”).

### **Response to Office Action**

Reconsideration and withdrawal of the rejections of record are again respectfully requested, in view of the foregoing amendments and the following remarks.

### ***Response to Rejection of Claims 20-23, 26-38 and 40 under 35 U.S.C. § 103(a)***

Claims 20-22, 26-38 and 40 remain rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over SINGH in view of ALTHAUS in further view of SONDHE. Further, claim 23 is newly rejected under 35 U.S.C. § 103(a) as allegedly being

unpatentable over SINGH in view of ALTHAUS in view of SONDHE in further view of McGAUGHEY.

The rejection essentially is a repetition of the allegations set forth in the previous Office Actions. In particular, the Examiner again concedes that SINGH “does not disclose the polyol component premixed before the mixing of the polyol component and the polyisocyanate component” and does not disclose a light resistant aromatic amine but essentially alleges that ALTHAUS would have rendered a corresponding premixing and the use of a light resistant amine obvious to one of ordinary skill in the art. The Examiner also concedes that SINGH “does not disclose bringing the mixture into contact with a synthetic resin not cured or not completely cured” but alleges that SONDHE renders obvious a corresponding process, SONDHE allegedly teaching “mixing (col. 13 line 31) a composition comprising an aromatic amine (col. 3 line 3), and a polyol component and a polyisocyanate component (abstract)”. In this regard, the Examiner asserts that SONDHE and SINGH “are analogous art because they are both concerned with the same field of endeavor, namely polyurethane compositions”. Regarding claim 23 (whose language is now incorporated in independent claim 20) the rejection concedes that SINGH does not disclose that the resin is applied onto the gel coat material but asserts that McGAUGHEY teaches applying a composite material of a polyurethane covered with an epoxy resin, wherefore it would allegedly have been obvious to one of ordinary skill in the art “to use the polyurethane of Singh et al. in the product of McGaughey et al. and would have been motivated to do so to achieve composite chemical processing equipment able to withstand corrosive environments as evidenced by McGaughey et al.”

Applicant respectfully traverses these rejections for all of the reasons which are set forth in the responses to the previous Office Actions. The corresponding remarks are expressly incorporated herein.

It further is pointed out that col. 1, lines 6-64 of SINGH states (emphasis added):

This invention relates to elastomeric polyurethane and/or polyurethane/urea products and more particularly to an effective process for lowering residual free aromatic polyisocyanates in prepolymers by incorporation of 2,4- toluene diisocyanate dimer into the prepolymer.

Aromatic polyisocyanates are well known and are widely used in the preparation of polyurethane and poly urethane/urea elastomers. These aromatic diisocyanates generally include compositions such as 2,4-toluene diisocyanate, 2,6-toluene diisocyanate, 4,4'-methylene bis (phenylisocyanate) and the like. In the preparation of polyurethane and polyurethane/urea elastomers, the aromatic diisocyanates are reacted with a long chain (high molecular weight) polyol to produce a prepolymer containing free isocyanate groups which then may be chain extended with a short chain (low molecular weight) polyol or aromatic diamine to form a polyurethane or polyurethane/urea elastomer. Long chain, high molecular weight polyols, e.g. those having a molecular weight of above 250, are generally utilized to form the prepolymer and the chain extender is generally a short chain polyol, e.g., C<sub>2</sub>-C<sub>10</sub> polyol, or an aromatic diamine. The long chain, high molecular weight polyol provides flexibility and elastomeric properties to the resin, while the short chain polyol or aromatic diamine provides chain extension or cross-links and adds toughness and rigidity to the resulting elastomeric polymer.

A major problem with mononuclear aromatic diisocyanates, e.g., toluene diisocyanate is that they are toxic and because of their low molecular weight tend to be quite volatile. Because of their toxicity and volatility, extreme care must be taken in the workplace to avoid inhalation and damage to the respiratory tract and contact with the skin.

It is known that residual toluene diisocyanate (free toluene diisocyanate) in prepolymer can be reduced by reducing the isocyanate/hydroxyl ratio of the prepolymer formulation. This method, however, has a detrimental consequence on processing when the prepolymer is chain extended (or cured), namely, the hardness build up rate decreases very significantly which leads to too long a demold time.

Economically, short demold times are very important. Once the reactants are mixed and poured into a mold, it is desirable to remove the product from the mold as soon as possible. The product must have sufficient strength to be handled and normally have sufficient strength to be employed in its intended purpose; however, the physical properties, if desired, usually can be improved by postcuring at elevated temperatures.

Surprisingly, it has been found that by incorporating 2,4 TDI dimer in the prepolymer, low NCO/OH ratio can be used to obtain the desired low residual free toluene diisocyanate content while maintaining the desired hardness build up rate.

This additive is the dimer of toluene diisocyanate which is commercially known as Desmodur<sup>TM</sup> TT available from Mobay Chemical Company.

Accordingly, SINGH is not concerned with the preparation of just any polyurethane but relates specifically and exclusively to the preparation of elastomeric polyurethane and/or polyurethane/urea products. As explained by SINGH, in the preparation of these polyurethane and polyurethane/urea elastomers the aromatic diisocyanates are reacted with a long chain (high molecular weight) polyol to produce a prepolymer containing free isocyanate groups which may then be chain extended with a short chain (low molecular weight) polyol or aromatic diamine to form a polyurethane or polyurethane/urea elastomer. The long chain, high molecular weight polyol provides flexibility and elastomeric properties to the resin, while the short chain polyol or aromatic diamine provides chain extension or cross-links and adds toughness and rigidity to the resulting elastomeric polymer.

Further, according to column 2, lines 23-27 and column 3, lines 17 to 29 of SINGH, in the preparation of the prepolymers only polyols having high molecular weight, optionally combined with polyols having a low molecular weight, may be used in combination with the isocyanate components. There is no mentioning of amines whatsoever in this regard.

In other words, even if one of ordinary skill in the art is aware that polyurethanes in general can be prepared by various processes and in particular, also a process in which all reactants are mixed together at the beginning of the reaction, in view of the disclosure of SINGH one of ordinary skill in the art will understand that a corresponding process would not be suitable for the production of the polyurethane and polyurethane/urea

elastomers described therein because it fails to provide the segmented structure required for elastomers, i.e., a structure comprising (i) (prepolymer) segments including a long chain, high molecular weight polyol which impart flexibility and elastomeric properties to the resin and (ii) segments including short chain polyol or aromatic diamine which impart toughness and rigidity to the resin.

At any rate, it is reasonable to assume that the inventors of SINGH were aware of the various methods of producing polyurethanes (which methods had been known already for decades when SINGH was filed) and would have mentioned these methods at least in passing as possible alternative ways of making the polyurethane/urea elastomers described by them if they had considered these methods at least somewhat suitable for the production of polyurethane elastomers. For the stated reasons alone, ALTHAUS cannot contribute anything to the teaching of SINGH.

Further, ALTHAUS fails to teach or suggest that the polyurethane/urea elastomers of SINGH can be made by processes mentioned therein which differ from the prepolymer process. Rather, the main object of ALTHAUS merely is to provide chain-lengthening agents or cross-linking agents for polyurethanes that do not combine the disadvantages of the amines of the prior art, i.e., are not carcinogenic or mutagenic such as MOCA and do not result in unreasonably short pot lives (see, e.g., col. 2, lines 3-6 in combination with col. 1, lines 29-51 of ALTHAUS).

Clearly, even knowing that 4,4-methylene-bis(anilines) are not carcinogenic or mutagenic and do not result in unreasonably short pot lives does not constitute an apparent reason for one of ordinary skill in the art to use 4,4-methylene-bis(anilines) in combination with low molecular weight polyols, high molecular weight polyols, TDI and

TDI dimer in the process for the preparation of the prepolymers of SINGH i.e., a process wherein no amines at all are employed. Regarding the “unreasonably short pot lives” disfavored by ALTHAUS it further is to be taken into account that SINGH apparently prefers pot lives which are as short as possible. See, e.g., col. 1, lines 49-52 of SINGH according to which “short demold times are very important. Once the reactants are mixed and poured into a mold, it is desirable to remove the product from the mold as soon as possible.”

It further is pointed out that independent claim 20 submitted herewith additionally contains language from former (now cancelled) claims 22 and 23 and is now drawn to an “in mold” process.

As set forth in the third paragraph of page 1 of the instant specification, in an in-mold process the gel coat system, after the mixing of its reaction components, is introduced into a mold within the processing time (pot life). The layer obtained after the gelling is sufficiently mechanically stable to not be damaged during the application of the synthetic resin.

Further, as set forth in the fourth paragraph of page 1 of the instant specification, in order to ensure adequate adhesion between (i) epoxy resin and/or vinyl ester resin (synthetic resin) and (ii) gel coat, the coating with synthetic resin must take place within the lamination time of the gel coat. Subsequently, the synthetic resin and gel coat are cured completely.

The problems with the systems known from the prior art are set forth in particular, in the passage starting in the middle of page 2 to page 4, first paragraph, of the instant

specification. Accordingly, there was a need for components for a polyurethane-based gel coat resin system for epoxy resin and/or vinyl ester resin composite material that:

- provide a comparatively long lamination time with a pot life sufficient for the mixing and introduction into the mold and gel and tack free times sufficient for film formation, but comparatively short;
- are easily processable (i.e., require no additional devices for hot application and/or spray application).

None of the documents relied upon by the Examiner addresses these problems, let alone suggests any solution therefor. On the contrary, SINGH neither teaches nor suggests combining a polyurethane with any synthetic resin and as pointed out above, SINGH requires a polyurethane that cures as quickly as possible (has short demold times). This would make it virtually impossible to apply thereon any synthetic resin while the gel coat material (polyurethane) is still not completely cured at the time it is contacted with the synthetic resin. Very short pot lives are entirely acceptable (and even preferred) for the process described by SINGH because this document relates to classical cast resin technology but not to a molded body having a laminate structure. In other words, a lamination process with a two-step hardening as recited in instant claim 20 is not taught or suggested by SINGH. In particular, the concept of a “lamination time” associated with the instant process does not make sense in the context of SINGH.

Further, turning to the curing of the prepolymer according to SINGH, the passage from col. 3, line 46 to col. 4, line 23 of this document describes the reaction of  $\text{NH}_2$  groups of the aromatic diamine component with NCO groups of the prepolymer. It is important to note that SINGH emphasizes that the number of  $\text{NH}_2$  groups should be



approximately equal to the number of NCO groups. Consequently, if an amine is used as chain extender and crosslinking agent at all, SINGH teaches a polyurea product, i.e., not a polyurethane gel coat as produced by the process of the present invention.

As already set forth above, ALTHAUS is unable to cure any of the deficiencies of SINGH in that it is not specifically concerned with polyurethanes of the type described by SINGH and does not relate to “in-mold” processes at all.

Regarding SONDHE, it is pointed out that this document teaches an article comprising an epoxy base coat and a urethane top coat as a lane marker. The epoxy composition can be applied to the road with the urethane composition coated thereon.

To start with, in contrast to SINGH, SONDHE does not relate to an “in-mold” process. Secondly, the article taught by SONDHE is formed by applying a layer of urethane composition onto an epoxy composition, not *vice versa* as recited in the instant claims.

It also is to be pointed out that the urethane layer of SONDHE has to show good abrasion resistance and good weatherability but apparently it is not required (or even desired) to have elastomeric properties (as do the polyurethanes of SINGH).

Further, SONDHE and SINGH have in common that the polyurethanes disclosed therein are to cure as quickly as possible (see, e.g., col. 21, lines 9-35, col. 13, lines 29-36 of SONDHE). As set forth above, this would make it virtually impossible to apply thereon any synthetic resin while the gel coat material (polyurethane) is still not completely cured at the time it is contacted with the synthetic resin in an in-mold process.

Regarding McGAUGHEY and its alleged relevance with respect to former claim 23 it is pointed out that this document does not relate to the introduction of a gel coat

material into a mold, followed by the application of any synthetic resin onto the gel coat material, let alone followed by a multi-stage hardening of the gel coat material.

Quite to the contrary, according to the passages of McGAUGHEY relied upon by the Examiner the material disclosed therein includes a core or substrate made of steel or other structural material which, after suitable surface treatment, can be reinforced with a suitably treated resin material such as a polyester, phenolic, or epoxy resin, which is in turn reinforced by a mat or cloth of fibrous material (col. 2, lines 15-22). Further, depending upon the application, a resilient covering is adhered to the thus reinforced resin coating to enhance the abrasion resistance thereof, which resilient material may be selected from the group of elastomeric materials such as silicone, polyurethane, neoprene, natural rubber, etc. (col. 2, lines 55-64). In other words, if anything at all, McGAUGHEY discloses the possible application of a polyurethane composition onto a fiber reinforced resin such as, e.g., an epoxy resin that is present on a core or substrate made of steel or other structural material, contrary to what is recited in instant claim 20.

Further, in the passage starting at col. 5, line 69 thereof McGAUGHEY describes that before application of the resilient coating the synthetic resin (with fiber reinforcement) should be (fully) hardened and should then be washed with acetone. Thereafter the resin layer is grit blasted to expose some of the reinforcing fibers. This not only not in accordance with instant claim 20 which recites, *inter alia*, that the synthetic resin is not, or at least not completely cured at the time it is contacted with the gel coat material, but even teaches away therefrom.

At any rate, at least for all of the foregoing reasons, even a combination of the teachings of SINGH, ALTHAUS, SONDHE and McGAUGHEY would not result in the

subject matter of instant claim 20, wherefore the Examiner has failed to establish a *prima facie* case of obviousness of the subject matter of any of the present claims over these documents. Accordingly, withdrawal of the instant rejection is warranted, which action is respectfully requested.

***Response to Rejection of Claims 24 and 25 under 35 U.S.C. § 103(a)***

Dependent claims 24 and 25 remain rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over SINGH in view of ALTHAUS in further view of SONDHE and in further view of MOTSINGER. The rejection merely repeats the allegations set forth in the previous Office Action.

Applicant respectfully traverses this rejection for all of the reasons which are set forth in the responses to the previous Office Actions. The corresponding remarks are expressly incorporated herein.

It is pointed out again that there is no motivation for one of ordinary skill in the art to combine the disclosure of SINGH with the disclosure of MOTSINGER because SINGH relates to elastomeric polyurethane/ureas or polyurethanes whereas MOTSINGER relates to completely unrelated subject matter, i.e., to a force vector transducer.

Further, even for the production of the force vector transducer taught therein MOTSINGER does not teach or suggest combining (directly contacting) a (foamed) polyurethane and a fiber reinforced epoxy resin, let alone in a mold. Rather, MOTSINGER teaches these materials for making separate and distinct components of the

transducer, i.e. (foamed) polyurethanes for the production of the inner shell 11 and fiber reinforced epoxy resin for the production of the outer shell 10.

Even further, MOTSINGER also is unable to cure any of the deficiencies set forth above with respect to SINGH, ALTHAUS, SONDHE and McGAUGHEY.

***Response to Rejection of Claim 39 under 35 U.S.C. § 103(a)***

Dependent claim 39 remains rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over SINGH in view of ALTHAUS in further in view of SONDHE and in further view of CHAPIN. The rejection merely repeats the allegations set forth in the previous Office Action.

Applicant respectfully traverses this rejection for all of the reasons which are set forth in the responses to the previous Office Actions. The corresponding remarks are expressly incorporated herein.

Applicant is still unable to see that someone who wishes to modify the teachings of SINGH with respect to elastomeric polyurethane/ureas or polyurethanes would expect to find any useful information in this regard in a document which relates to completely unrelated subject matter, i.e., to air flow transducers for measuring the rate of air flow into an engine having a propensity to backfire.

Further, CHAPIN also is unable to cure any of the deficiencies set forth above with respect to SINGH, ALTHAUS, SONDHE and McGAUGHEY.

## CONCLUSION

In view of the foregoing, it still is believed that all of the claims in this application are in condition for allowance, wherefore an early issuance of the Notices of Allowance and Allowability is again respectfully solicited.

If any issues yet remain which can be resolved by a telephone conference, the Examiner is respectfully invited to contact the undersigned at the telephone number below.

Respectfully submitted,  
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/Heribert F. Muensterer/

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